Alg. 2 – Unit 10 Notes – Composition of Functions, Inverses, Square Root and Cube Root Functions

Day 1 – Perform Function Operations

Objective: SWBAT perform function operations

Operation and Definition Example: $f(x)=3x$, $g(x)=x+5$

Operation	Notation	Example
Addition	$h(x)=f(x)+g(x)$	
Subtraction	$h(x)=f(x)-g(x)$	
Multiplication	$h(x)=f(x)\bullet g(x)$	
Division	$h(x)=\frac{f(x)}{g(x)}$	

The domain of *h* consists of the *x*-values that are in the domains of both _____ and _____. Additionally, the domain of a quotient does not include *x*-values for which the denominator equals _____ _____.

$f(x)=4x^2$, $g(x)=x-7$, and $h(x)=x^2-5x-14$, and $j(x)=2x^{1/2}$

Find the following.

1. $g(x)+h(x)$
2. $f(x)-g(x)$
3. $f(x)\bullet j(x)$
4. $\frac{h(x)}{g(x)}$
5. $g(x)\bullet h(x)$
6. $h(x)+f(x)$
7. $\frac{j(x)}{f(x)}$
8. $j(x)-h(x)$

State the domains of the composite functions above.

1.
2.
3.
4.
5.
6.
7.
8.

Day 2 – Composition Functions

Objective: SWBAT input functions into other functions

Review: Use these functions to evaluate the following. $f(x) = 4x^2$ $j(x) = 2x^{1/2}$

1. $j(16)$

a. $f(5)$

Composition Functions: A function made of other functions, where the output of one is the input to the other.

Notation: $f(g(x))$ $f \circ g$ $g(f(1))$

Given the following functions, evaluate the following composite functions.

$(x) = 4x^2$ $g(x) = x - 7$ $h(x) = 5x^2 - 3x + 2$ $j(x) = x^{1/2}$

1. $h(g(9))$ **2.** $f(h(1))$ **3.** $(g \circ j)(4)$ **4.** $(j \circ f)(-2)$

5. $g(f(x))$ **6.** $f(g(x))$ **7.** $f(f(x))$ **8.** $f \circ j$

9. $h(j(x))$ **10.** $j \circ j$ **11.** $j(f(x))$ **12.** $g(g(x))$

State the domains of the composite functions above.

5. **6.** **7.** **8.**

Day 3 – Inverse Functions

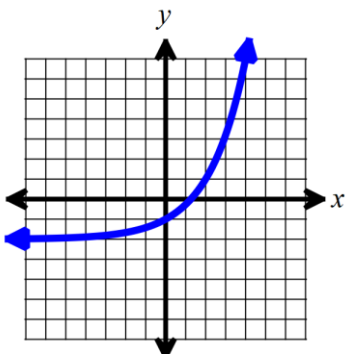
Objective: SWBAT find inverses of functions
SWBAT verify an inverse of a function

Functions: An equation where each input has a single output.

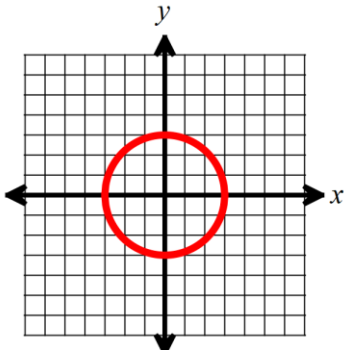
Vertical Line Test: A relation, $f(x)$, is a function if and only if no vertical line intersects the graph of $f(x)$ more than _____.

Look at the graphs of the following functions and determine if they are functions.

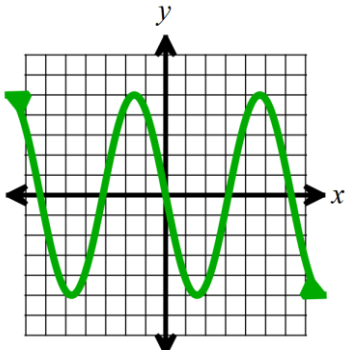
1. $y = 3^{5x} - 2$



2. $f(x) = \pm\sqrt{-x^2 + 9}$

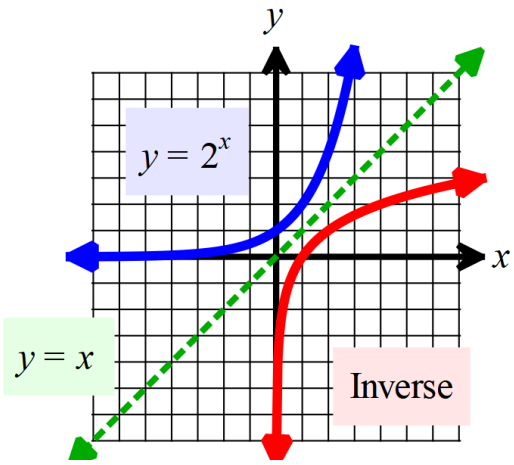


3. $y = -5\sin(x)$



Inverse relationship – A relationship that undoes another relationship. Examples, adding/subtracting, multiplying/dividing, powers/radicals. To find, switch the input (x) and the output (y) and solve for y.

Inverse functions – When the original relationship and the inverse are both functions. Inverse functions are symmetric to the line y = x.



Find the inverse of the following equations.

1. $y = 7x - 4$

2. $f(x) = \frac{2}{3}x + 6$

3. $y = -x + 4$

4. $y = \frac{5}{x} + 4$

Find the inverse of the following power functions.

6. $f(x) = \frac{1}{4}x^3 + 3$

7. $g(x) = x^4 - 9$

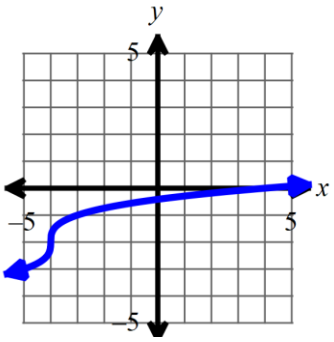
8. $h(x) = 4x^2,\ x \le 0$

9. $p(t) = 64t^6,\ t \ge 0$

Horizontal Line Test: An inverse relation, $f^{-1}(x)$, is a function if and only if no horizontal line intersects the graph of ***f(x)*** more than _____.

Given the graph the following functions determine if they are functions or not. Inverses?

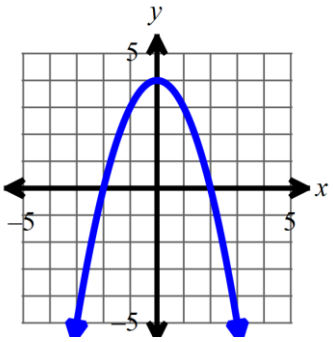
10. $y = \sqrt[3]{x+4} - 2$



Is it a Function: _____

Inverse a Function? _____

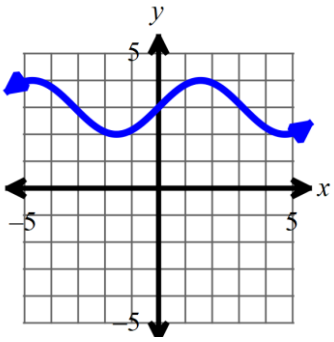
11. $f(x) = -x^2 + 4$



Is it a Function: _____

Inverse a Function? _____

12. $y = \sin(x) + 3$



Is it a Function: _____

Inverse a Function? _____

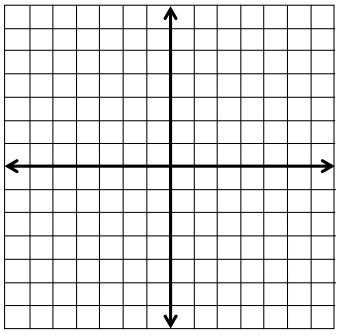
Day 4 – Graphing Radical Functions – Square Roots

Objective: SWBAT graph square roots

Radical function – an equation where the input variable (x) is inside a radical

PARENT FUNCTION FOR SQUARE ROOT FUNCTIONS

$f(x) = \sqrt{x}$



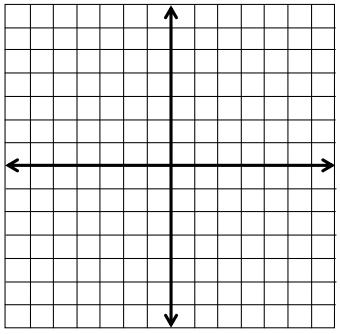
Domain:

Range:

x					
y					

Graph the following radical functions using a table, and then state the domain and range.

1. $y = \sqrt{x-1} + 2$



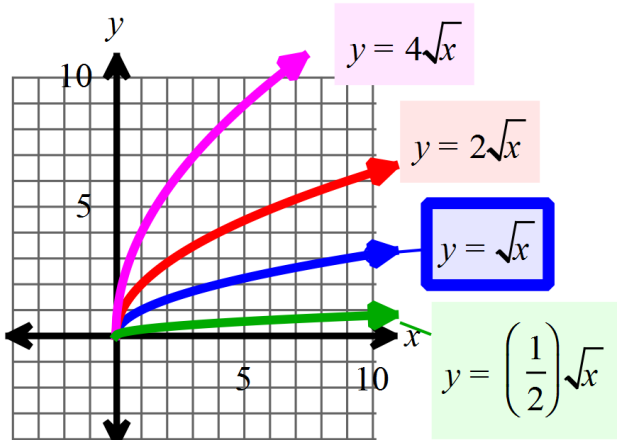
Domain:

Range:

x	***work***	***y***

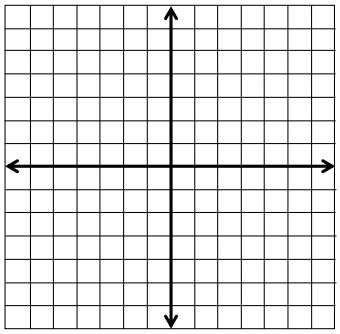
Transformations of Radical Functions $f(x) = \pm a\sqrt{x-h} \pm k$

Starting Point (h, k)		
Growth Factor of Square Root Graph		
x	y	a
Right	**Up / Down**	



Graph the following radical functions using a table, and then state the domain and range.

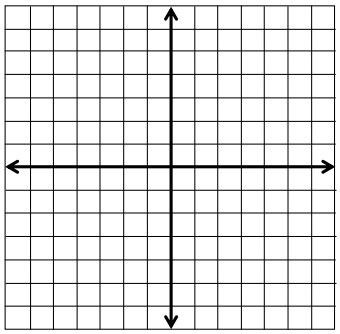
2. $y = \sqrt{x+1}$



Starting Point (h, k)		
↔	↕	a

Domain: _____ **Range:** _____

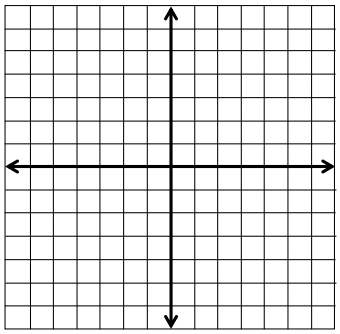
3. $f(x) = (x-2)^{\frac{1}{2}} + 1$



Starting Point (h, k)		
↔	↕	a

Domain: _____ **Range:** _____

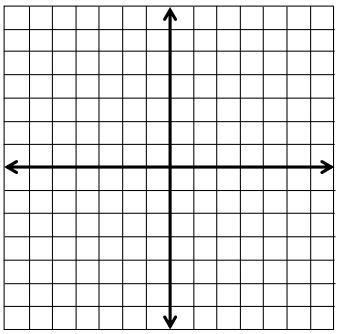
4. $f(x) = \sqrt{x} + 1$



Starting Point (h, k)		
↔	↕	a

Domain: _____ **Range:** _____

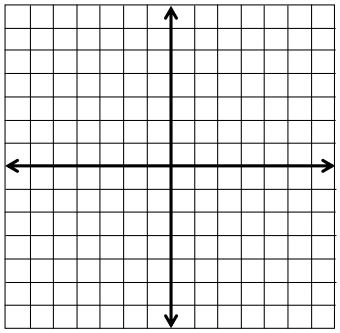
5. $f(x) = -\sqrt{x+4} + 6$



Starting Point (h, k)		
↔	↕	a

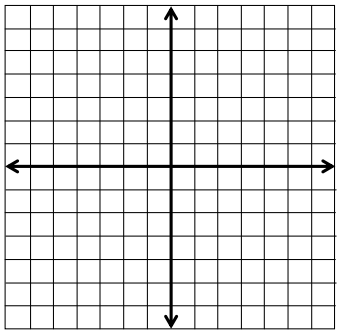
Domain: _____ **Range:** _____

6. $y = 2\sqrt{x}$



Domain: _____ Range: _____

7. $f(x) = -4x^{\frac{1}{2}} + 5$



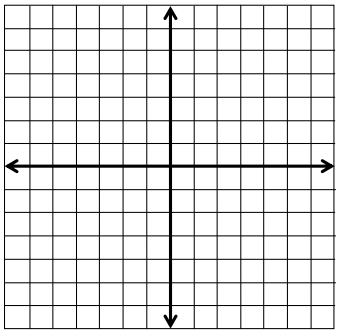
Domain: _____ Range: _____

Day 5 – Graphing Radical Functions – Cube Roots

Objective: SWBAT graph cube roots

PARENT FUNCTION FOR CUBE ROOT FUNCTIONS

$f(x) = \sqrt[3]{x}$



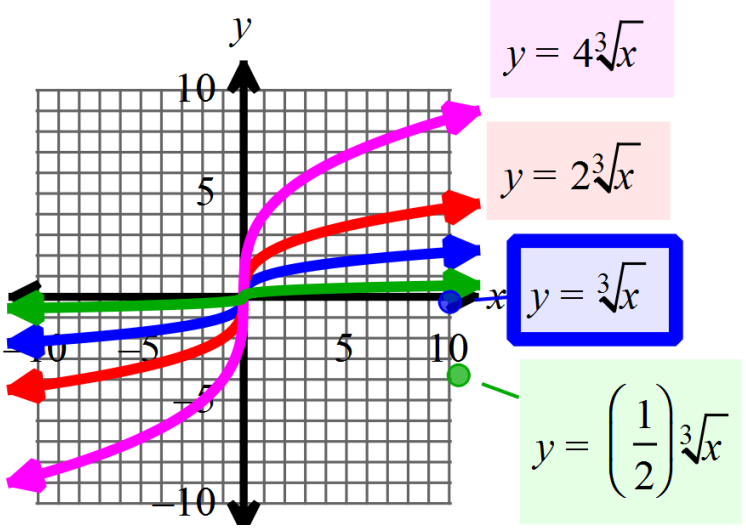
Domain:

Range:

x					
y					

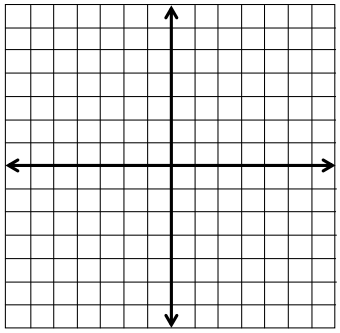
Transformations of Radical Functions $f(x) = \pm a\sqrt[3]{x-h} \pm k$

Starting Point (h, k)		
$\leftrightarrow$	$\updownarrow$	a



Graph the following radical functions using a table, and then state the domain and range.

2. $y = \sqrt[3]{x} - 4$

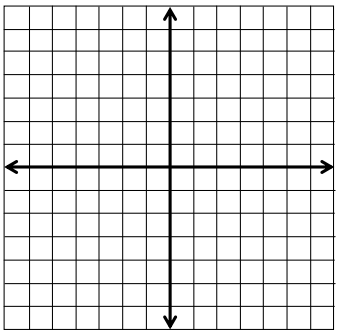


Starting Point (h,k)		
$\leftrightarrow$	$\updownarrow$	a

Domain: _____ **Range:** _____

End Behavior: $x \to -\infty, f(x) \to$ _____
$x \to +\infty, f(x) \to$ _____

3. $f(x) = (x+4)^{\frac{1}{3}} + 3$

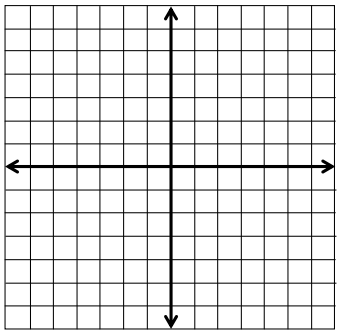


Starting Point (h,k)		
$\leftrightarrow$	$\updownarrow$	a

Domain: _____ **Range:** _____

End Behavior: $x \to -\infty, f(x) \to$ _____
$x \to +\infty, f(x) \to$ _____

4. $f(x) = \sqrt[3]{x-1}$

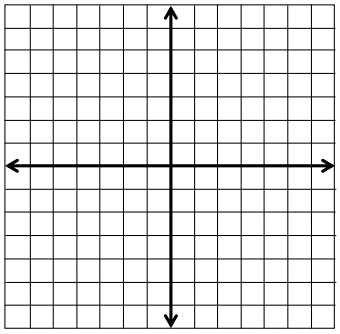


Starting Point (h,k)		
$\leftrightarrow$	$\updownarrow$	a

Domain: _____ **Range:** _____

End Behavior: $x \to -\infty, f(x) \to$ _____
$x \to +\infty, f(x) \to$ _____

5. $f(x) = -\sqrt[3]{x+2} + 5$

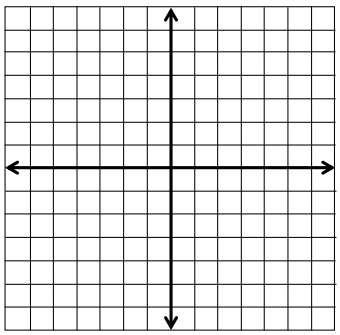


Starting Point (h,k)		
$\leftrightarrow$	$\updownarrow$	a

Domain: _____ **Range:** _____

End Behavior: $x \to -\infty, f(x) \to$ _____
$x \to +\infty, f(x) \to$ _____

6. $y = 3\sqrt[3]{x-3} - 1$

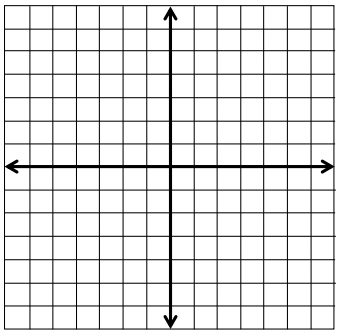


Starting Point (h,k)		
$\leftrightarrow$	$\updownarrow$	a

Domain: _____ **Range:** _____

End Behavior: $x \to -\infty, f(x) \to$ _____
$x \to +\infty, f(x) \to$ _____

7. $f(x) = -2(x+1)^{\frac{1}{3}}$



Starting Point (h,k)		
$\leftrightarrow$	$\updownarrow$	a

Domain: _____ **Range:** _____

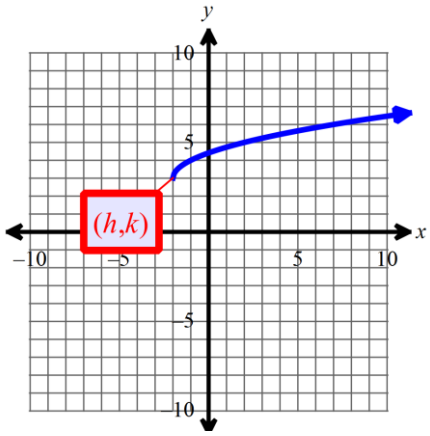
End Behavior: $x \to -\infty, f(x) \to$ _____
$x \to +\infty, f(x) \to$ _____

Day 6 – Interpreting Square and Cube Root Functions

Objective: SWBAT state the domain, range, and end behavior of each function without a graph.

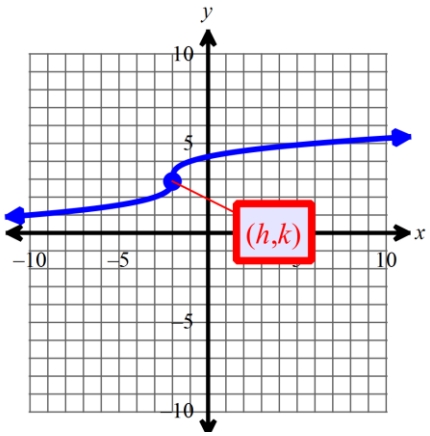
Square Roots

$$f(x) = \pm a\sqrt{x-h} \pm k$$



Cube Roots

$$f(x) = \pm a\sqrt[3]{x-h} \pm k$$



State the domain, range, end behavior, and transformation of the following radical equations without graphing them. If the parent function is $g(x)$ then write the given function in terms of $g(x)$.

1. $f(x) = \sqrt{x-4} + 5$ **Mental Picture**

Domain:

Range:

End Behavior:

2. $f(x) = \sqrt[3]{x+7} - 3$ **Mental Picture**

Domain:

Range:

End Behavior:

3. $y = -\frac{1}{2}(3x+8)^{1/2} - 1$ **Mental Picture**

Domain:

Range:

End Behavior:

4. $y = -\frac{25}{72}x^{1/3} - 121$ **Mental Picture**

Domain:

Range:

End Behavior:

Day 7 – Solve Radical Equations Analytically – Part 1

Objective: SWBAT solve radical equations analytically

SOLVING RADICAL EQUATIONS

Step 1: _____ the radical on one side of the equation, if necessary.
Step 2: **Raise** each side of the equation to the same _____ to eliminate the radical.
Step 3: _____ the remaining linear or quadratic equation.
Step 4: Check your answer(s) and discard any _____ solutions.

Solve the following radical equations.

1. $\sqrt{x+6} = 3$

2. $\sqrt[3]{5x-1} + 6 = 10$

3. $2\sqrt[3]{8x} + 9 = 5$

4. $\sqrt{x^2+6x} = 4$

5. $\sqrt{-10x+24} = x$

6. $(2x-1)^{1/4} = -3$

7. $x - 5 = \sqrt{x+7}$

8. $\sqrt{2x+7} = x + 2$

Day 8 – Solve Radical Equations Analytically – Part 2

Objective: SWBAT solve radical equations analytically

Solve the following radical equations.

1. $(3x+4)^{\frac{2}{3}}=16$

2. $x-2=\sqrt{x+10}$

3. $-2x^{\frac{3}{2}}-21=-37$

4. $(2x+7)^{\frac{1}{2}}=x+2$

5. $\sqrt{x+6}+2=\sqrt{10-3x}$

6. $\sqrt{x+5}=\sqrt{3x+4}-1$

Day 11 – Modeling Radical Equations and solving Radical Equations graphically

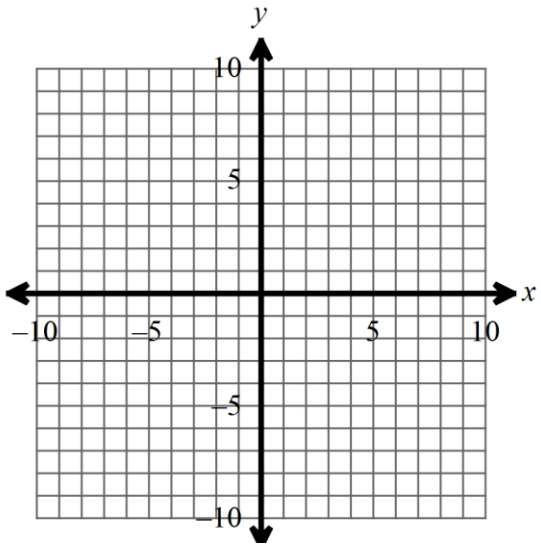
Objective: SWBAT solve radical equations with a calculator

SOLVING RADICAL EQUATIONS BY GRAPHING

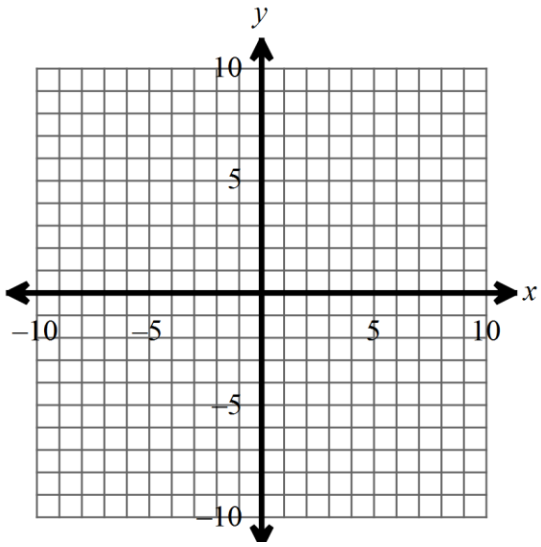
Step 1	Set both sides of the equation as their own **Equation** ***Think of $\sqrt[3]{x-1}+5=x+4$ as a system of two equations*** $\begin{cases} y=\sqrt[3]{x-1}+5 \\ y=x+4 \end{cases}$
Step 2	**Graph** each function individually with a calculator or by table
Step 3	The solution is where the functions **intersect.**

Solve the following equations by graphing

1. $x-5=\sqrt{x+7}$



2. $\sqrt{x-3}=5-\sqrt{x+2}$



3. *Wind Velocity:* In a hurricane, the mean sustained wind velocity (in meters per second) is given by

$$v(p) = 6.3\sqrt{1013 - p}$$

where p is the air pressure (in millibars) at the center of the hurricane. Estimate the air pressure at the center of the hurricane when the mean sustained wind velocity is 54.5 meters per second.

Solve the previous problem algebraically.

Solve the above problem by using the table function of your calculator.

How to solve using the table –

4. Solve $\sqrt{25 - x} = 8$ by using the table.

Solve the above problem by using the graphing function of your calculator.

How to solve using the graph –

5. Solve $2.3\sqrt{x - 1} = 11.5$ by using the graph.

Solve the following problem by using the method of your choice.

6. A model rocket is launched 25 feet from you. When the rocket is at height h, the distance d between you and the rocket is given by $d = \sqrt{625 + h^2}$ where h and d are measured in feet. What is the rockets' height when the distance between you and the rocket is 100 ft?